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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/519,073	12/23/2004	Atsushi Fukui	MAM-056	7337

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EXAMINER

LEE, CYNTHIA K

ART UNIT	PAPER NUMBER
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1745

DATE MAILED: 04/11/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b> 10/519,073	<b>Applicant(s)</b> FUKUI ET AL.	
	<b>Examiner</b> Cynthia Lee	<b>Art Unit</b> 1745	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 13 July 2005.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 2-8, 11, 13-15, 17 and 20-22 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 2-8, 11, 13-15, 17 and 20-22 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 23 December 2004 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |   |   |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)  | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date <u>12/23/2004</u> . | 6) <input type="checkbox"/> Other: _____  |

***Priority***

Acknowledgement has been made of applicant's claim for priority under 35 USC 119 (a-d). The certified copy has been filed on 12/23/2004.

***Preliminary Amendment***

The claims filed 12/23/2004 has been placed in the application file and the information referred to therein has been considered as to the merits.

***Information Disclosure Statement***

The Information Disclosure Statement (IDS) filed 12/23/2004 has been placed in the application file and the information referred to therein has been considered.

***Drawings***

The drawings are objected to because where only a single view is used in an application to illustrate the claimed invention, it must not be numbered and the abbreviation "FIG." must not appear. Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after

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the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

### ***Specification***

The disclosure is objected to because of the following informalities:

It is unclear what the applicant means by "the other thermoplastic polyimide (binder  $\alpha$ 3)" (emphasis added). (pg. 30, lines 20-21)

Throughout the experimental portion of the specification, all the experiments are referred to as "Experiment 1" (for example, see pgs 23, 24 (line 1, line 17), 25, 30, ...) and it is confusing because those experiments describe how they differ from Experiment 1. Applicant is advised to give different Experiment numbers to distinguish each experiment and make it less confusing.

Further, it is unclear how the binder  $\beta$ 1 differs from binder  $\alpha$ 1 since both binders are produced by the same procedure of Experiment 1 and in both binders used polyamic acid and heat treated to produce polyimide from polyamic acid and the polyamide content, by weight, in the active material layer was 18.2% (refer to pgs. 19 and 30).

Appropriate correction is required.

### ***Double Patenting***

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the

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unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

Claims 2-8, 11, 13-15, 17, 20-22 are provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-4, 6-9, 12, 19, 21, 24, 41, and 75-77 of copending Application No. 10/363039. Although the conflicting claims are not identical, they are not patentably distinct from each other. Both sets of claims claim a negative electrode comprising active material particles containing silicon and/or silicon alloy, a binder on a current collector with a specific surface roughness of the current collector. Although the instant claims do not recite the diffusion of particles, it is noted that a copper metal foil would meet this limitation, as disclosed by the copending specification (pg. 8, lines 1-10). Although the copending claims do not expressly recite the mechanical properties of a current collector and a binder as claimed in the instant application, it is deemed to have been met by a process in which a surface roughened copper foil current collector and the binder are sintered

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below the decomposition temperature and above the glass transition temperature of the binder.

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

Claims 2-8, 11, 13-15, 17, 20-22 are provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-4, 6-9, 12, 19, 21, 24, 41, and 75-77 of copending Application No. 10/673348. Although the conflicting claims are not identical, they are not patentably distinct from each other. Both sets of claims claim a negative electrode comprising active material particles containing silicon and/or silicon alloy, a binder on a current collector with a specific surface roughness of the current collector. Although the instant claims are not claiming a slurry, the specification discloses and thus enables one of ordinary skill in the art to mix the binder, conductive material, and active material to form a slurry.

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

Claims 2-8, 11, 13-15, 17, 20-22 are provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-15 of copending Application No. 11/001192. Although the conflicting claims are not identical, they are not patentably distinct from each other. Both sets of claims claim a negative electrode comprising active material particles containing silicon and/or

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silicon alloy, a binder on a current collector with a specific surface roughness of the current collector. The electrode assembly in the instant application is a flat cell and is not spirally rolled. However, spirally shaped batteries are common in the art and it would have been obvious to one of ordinary skill in the art at the time the invention was made to make a flat cell a spiral battery for the benefit of increasing the capacity of the cell by being able to roll the active material layer, versus a single flat layer. Further, the specification of the instant application discloses and enables one of ordinary skill in the art to make a negative electrode active material thickness of between 10 and 1000 micrometers of the cell [0030]. In the case where the claimed ranges “overlap or lie inside ranges disclosed by the prior art” a prima facie case of obviousness exists, see MPEP 2144.05. Further, it has been held by the courts that where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation. *In re Swain et. al.*, 33 CCPA 1250, 156 F.2d 239, 70 USPQ 412.

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

### ***Claims Analysis***

The limitation “the current collector is subject to heat treatment before the active material layer is provided on the surface of the current collector” was considered, but was not given patentable weight because the courts have held that the method of forming the product is not germane to the issue of patentability of the product itself. *In re Thorpe*, 777 F.2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985). See MPEP 2113.

***Claim Rejections - 35 USC § 102/103***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 2-8, 11, 13-15, 17, 20-22 are rejected under 35 U.S.C. 102(e) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Nobufumi (JP 2000-012088).

Nobufumi discloses a negative electrode and a rechargeable lithium battery comprising a mixture of silicon-containing anode material, carbon material, and a binder. The mixture is prepared and a base material made of a foil or mesh of conductive metal is coated with the mixture to form a coated film. The coated film is sintered in a non-oxidizing atmosphere, thereby integrating a sintered material of the coated film with the base material. Nobufumi discloses that the base material is an electrolytic copper foil. The rechargeable lithium battery includes a positive electrode material and a nonaqueous electrolyte. The particle size of the silicon-containing



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compounds is from 0.01  $\mu\text{m}$  to 100  $\mu\text{m}$ . (See abstract, [0005, 0007, 0011, 0020, 0032-39, 0058-0061]) Nobufumi discloses that the conductive metal foil thickness is between 3 and 100  $\mu\text{m}$ . The current collector has a roughness of 0.03 to 1  $\mu\text{m}$ . Nobufumi discloses that the thickness of the anode active material is between 10-1000  $\mu\text{m}$  and depends on the magnitude of the cell [0040]. Nobufumi further discloses that the binder is a thermoplastic polyimide. Nobufumi discloses that sintering is carried out at 150 C [0061]. Further, the binder used is polyvinylidene fluoride. The glass transition temperature is 30 C and the melting temperature is 158 C (see reference attached).

Nobufumi does not disclose that  $5Y \geq X$  and  $250Ra \geq X$  in which X is the thickness of the active material layer, Y is the thickness of the current collector, and Ra is the surface roughness of the current collector. However, X affects the amount of the active material present in the anode and the distance required for the charge to travel to the current collector. Y affects the current collecting capability and the resistance of the material. Ra affects the adhering capability of the current collector. All these variables are clearly result effective variables and it has been held by the courts that discovering an optimum value or workable ranges of a result-effective variable involves only routine skill in the art, and thus not novel. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). See MPEP 2144.05.

The limitations recited in claim 2 are deemed to have been met by a process in which a surface roughened copper foil current collector and the binder are sintered below the decomposition temperature and above the melting temperature of the binder.

Claims 2-8, 11, 13-15, 17, 20-22 are rejected under 35 U.S.C. 102(e) as being unpatentable over Fukui (US 2004/0043294).

Fukui discloses a negative electrode for a rechargeable lithium battery which includes a conductive metal foil current collector and an active material layer on the current collector comprising a binder, a conducting agent, and active material containing silicon or a silicon alloy. Fukui discloses that the surface roughness of the metal foil is 0.2  $\mu\text{m}$  or larger. Fukui discloses that the conductive metal foil further comprises an electrolytic copper foil, and electrolytic copper alloy foil, a metal foil having an electrolytic copper surface, or a metal foil having an electrolytic copper alloy surface. Fukui discloses that the binder is polyimide. (Fukui's claims 1-20) Fukui discloses that the heat treatment is carried out below the decomposition temperature of the binder [0035]. Fukui further discloses that the heat treatment is carried out between 200-500 C. Also, the binder used is polyvinylidene fluoride and the glass transition temperature is 30 C and the melting temperature is 158 C (see reference attached).

Fukui does not disclose that  $5Y \geq X$  and  $250Ra \geq X$  in which X is the thickness of the active material layer, Y is the thickness of the current collector, and Ra is the surface roughness of the current collector. Fukui discloses that the thickness of the metal oil is in the range of 10-100  $\mu\text{m}$  [0030]. Fukui discloses that the sintered layer has a thickness in the range of 10-100  $\mu\text{m}$  [0030]. The surface roughness is in the range of 10-100  $\mu\text{m}$  [0019]. X affects the amount of the active material present in the anode and the distance required for the charge to travel to the current collector. Y affects the current collecting capability and the resistance of the material. Ra affects the adhering

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capability of the current collector. All these variables are clearly result effective variables and it has been held by the courts that discovering an optimum value or workable ranges of a result-effective variable involves only routine skill in the art, and thus not novel. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). See MPEP 2144.05.

Fukui further discloses a rechargeable lithium battery including the negative electrode, a positive electrode containing a positive electrode, and a nonaqueous electrolyte (Fukui's claim 74).

The limitations recited in claim 2 are deemed to have been met by a process in which a surface roughened copper foil current collector and the binder are sintered below the decomposition temperature and above the melting temperature of the binder.

### ***Conclusion***

The X reference (WO 02/21616) cited in the International Search Report made of record and not relied upon is considered pertinent to applicant's disclosure.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Cynthia Lee whose telephone number is 571-272-8699. The examiner can normally be reached on Monday-Friday 8:30am-5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Ryan can be reached on 571-272-1292. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.


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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

ckl

Cynthia Lee

Patent Examiner



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